

***What Is Claimed is:***

1. A membrane interface probe apparatus comprising:  
a membrane interface probe (MIP) sensor having a larger diameter than a conventional MIP sensor.
2. The MIP apparatus according to claim 1 wherein said larger diameter MIP sensor is adapted for direct coupling to larger diameter rod systems.
3. The MIP apparatus according to claim 1 wherein said larger diameter MIP sensor allows use of said MIP sensor with larger capacity push and hammer systems.
4. The MIP apparatus according to claim 1 wherein said larger diameter MIP sensor allows use in situations where a low sidewall support of the drive rod string exists.
5. The MIP apparatus according to claim 1, wherein said larger diameter MIP sensor is adapted to include two or more permeable membranes.
6. A membrane interface probe apparatus comprising:  
a membrane interface probe (MIP) sensor having two or more permeable membranes.
7. The MIP sensor of claim 6, wherein said two or more permeable membranes are arranged equidistant about a circumference of said MIP sensor.
8. The MIP sensor of claim 7, wherein said MIP sensor is operative to improve circumferential sensing and to increase likelihood of collection of volatile organic mass by said MIP sensor.

9. A membrane interface probe apparatus comprising:  
a membrane interface probe (MIP) sensor adapted to improve watertight integrity  
by including undersea cabling electrical couplings and O-ring mechanical couplings.
10. A modular membrane interface probe (MIP) apparatus comprising:  
a modular membrane interface probe (MIP) sensor constructed from a plurality of  
modular components allowing field serviceable replacement of any malfunctioning  
components of said plurality of modular components.
11. The modular MIP apparatus according to claim 10, comprising at least one of:  
an external barrel having a cavity; and  
an inner core barrel assembly field-insertable into said cavity having a heater  
cavity, wherein said heater cavity is adapted to receive a field-insertable removable  
cartridge heating element.
12. The modular MIP of claim 10, wherein said modular MIP apparatus comprises a  
removable conductivity nose assembly.
13. The modular MIP of claim 10, wherein said modular MIP apparatus comprises a  
field-insertable removable cartridge heating element.
14. The modular MIP of claim 10, wherein said modular MIP apparatus comprises at  
least one of a waterproof electrical connector and an O-ring seal.
15. A membrane interface probe apparatus comprising:  
a membrane interface probe (MIP) sensor comprising a removable trap directly  
into the probe for the collection and concentration of volatile organic compounds.

16. The MIP apparatus according to claim 15, wherein said removable trap enables detection of lower levels of concentration of said volatile organic compound, and specific identification of compounds through post run chromatographic analysis.

17. The MIP apparatus according to claim 15, further comprising: providing for calibration of said MIP sensor using chromatographic methods.

18. The MIP apparatus according to claim 15, further comprising means for simultaneous trapping and concentrating of volatile organic compounds during MIP sampling and logging events.

19. A membrane interface probe apparatus comprising:

a membrane interface probe (MIP) sensor comprising a heated transfer line from a body of said MIP sensor to a surface detector suite minimizing loss of volatile organic compounds in a cold transfer line.

20. A membrane interface probe apparatus comprising:

a membrane interface probe (MIP) sensor comprising an enhanced scanning solutions module, and a sample introduction system adapted to reduce overall equipment footprint and cost; to introduce calibration gases; and to allow for simultaneous sampling of volatile organic gas stream for immediate chromatographic analysis.

21. A membrane interface probe apparatus comprising:

a membrane interface probe (MIP) sensor comprising a global positioning system (GPS) receiver integrated with a data acquisition system adapted to allow simultaneous geo-referencing of sampling points with sample data.

22. A membrane interface probe system comprising:

a membrane interface probe (MIP) sensor comprising a mobile device in wireless communication with a data acquisition system enabling near real-time transfer of data from said MIP sensor to a base station.

23. The MIP system of claim 22, wherein said mobile device comprises a graphical display and control module adapted to operate said data acquisition system operation.

24. The MIP system of claim 22, wherein said mobile device is portable.

25. The enhanced scanning solutions module of claim 20, comprising:  
a flow control subsystem;  
a detector subsystem coupled to said flow control subsystem;  
a dryer/moisture separator subsystem coupled to said flow control subsystem;  
a sampling subsystem coupled to said flow control subsystem; and  
a software control subsystem coupled to at least one of said flow control subsystem, said detector subsystem, said dryer/moisture separator subsystem, and said sampling subsystem.

26. The enhanced scanning solutions module of claim 25, wherein said sampling subsystem comprises at least one of:  
a sample loop;  
an absorbent trap; and  
a gas chromatography injection port.

27. The enhanced scanning solutions module of claim 25, further comprising at least one of:  
an exhaust;  
a pneumatic supply;  
a power supply;

- a bypass module;
  - a feedback signal; and
  - a pressure control subsystem.
- 28. The enhanced scanning solutions module of claim 20, comprising:
  - a detector subsystem;
  - a sampling subsystem; and
  - a software control subsystem coupled to said detector subsystem, and said sampling subsystem.
- 29. The enhanced scanning solutions module of claim 28, further comprising:
  - a dryer/moisture separator subsystem coupled to said software control subsystem.
- 30. The enhanced scanning solutions module of claim 28, wherein said sampling subsystem comprises at least one of:
  - a sample loop;
  - an absorbent trap; and
  - a gas chromatography injection port.
- 31. The enhanced scanning solutions module of claim 28, further comprising at least one of:
  - an exhaust;
  - a pneumatic supply;
  - a power supply;
  - a bypass module;
  - a feedback signal; and
  - a pressure control subsystem.

32. The enhanced scanning solutions module of claim 28, wherein said enhanced scanning solutions module comprises on-the-fly reconfigurability, and further comprises:
  - a plurality of operator-selectable modes.
33. The enhanced scanning solutions module of claim 28, wherein said enhanced scanning solutions module further comprises:
  - a plurality of pre-programmable operating modes that interactively reconfigures to perform any of a plurality of functions, subject to particular conditions.
34. The enhanced scanning solutions module of claim 28, wherein said enhanced scanning solutions module further comprises:
  - an interface between said detector subsystem and a gas handling subsystem allowing insertion of at least one of: a sample, another detector, a flowpath, a flow path rate, a dryer, an exhaust, a feedback, and a trap.
35. The enhanced scanning solutions module of claim 28, wherein said software control subsystem comprises at least one of:
  - a data logger;
  - a sequencer;
  - a valve control system;
  - a monitor;
  - a display; and
  - a recording function.